Complete Summary

GUIDELINE TITLE

Guidelines for the prevention of intravascular catheter-related infections.

BIBLIOGRAPHIC SOURCE(S)

O'Grady NP, Alexander M, Dellinger EP, Gerberding JL, Heard SO, Maki DG, Masur H, McCormick RD, Mermel LA, Pearson ML, Raad II, Randolph A, Weinstein RA. Guidelines for the prevention of intravascular catheter-related infections [published erratum appears in MMWR Weekly 2002 Aug 16;51(32):71]. MMWR Recomm Rep 2002 Aug 9;51(RR-10):1-29. [293 references] PubMed

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Intravascular catheter-related infections

GUIDELINE CATEGORY

Prevention

CLINICAL SPECIALTY

Anesthesiology
Cardiology
Critical Care
Infectious Diseases
Internal Medicine
Nursing
Oncology
Preventive Medicine

Pulmonary Medicine
Surgery

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Health Care Providers
Hospitals
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

To provide evidence-based recommendations for preventing catheter-related infections

TARGET POPULATION

Adults and children requiring the placement of intravascular catheters

INTERVENTIONS AND PRACTICES CONSIDERED

Strategies for Prevention of Catheter-related Infections

1. Selection of site for catheter insertion
2. Type of catheter material used (e.g., Teflon®, polyurethane, polyvinyl chloride, polyethylene, steel)
3. Hand hygiene and aseptic technique during catheter insertion (e.g., use of antibacterial soap and water, alcohol-based products, gloves, etc.)
4. Skin antisepsis with povidone-iodine or chlorhexidine
5. Catheter site dressing regimens (e.g., use of transparent, semipermeable polyurethane dressings, gauze, or chlorhexidine-impregnated sponge [Biopatch™])
6. Use of catheter securement devices (sutures versus sutureless)
7. Use of in-line filters
8. Use of antimicrobial/antiseptic impregnated catheters and cuffs (e.g., chlorhexidine/silver sulfadiazine, minocycline/rifampin, platinum/silver impregnated catheters; silver cuffs)
9. Systemic antibiotic prophylaxis (e.g., vancomycin) (considered but not recommended because of risk-benefit ratio)
10. Application of antibiotic/antiseptic ointment (e.g., povidone-iodine, mupirocin) to catheter site
11. Antibiotic lock prophylaxis
12. Anticoagulant flush solutions (e.g., heparin, warfarin)
13. Scheduled replacement of catheters
14. Replacement of administration sets, needleless systems, and parenteral fluids
15. Use of needleless infusion systems
16. Use of multidose parenteral medication vials

17. Special considerations for prevention of catheter-related infections in pediatric patients and in patients on hemodialysis or those receiving parenteral nutrition.
18. Health-care worker education and training

MAJOR OUTCOMES CONSIDERED

- Incidence of and risk for intravascular catheter-related infection and phlebitis
- Morbidity and mortality due to intravascular catheter-related infections
- Healthcare costs associated with intravascular catheter-related infections

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Not stated

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The recommendations presented in this report reflect consensus of Healthcare Infection Control Practices Advisory Committee (HICPAC) and other professional organizations.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Recommendations Grading Scheme

Category IA. Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.

Category IB. Strongly recommended for implementation and supported by certain experimental, clinical, or epidemiologic studies and a strong theoretical rationale.

Category IC. Required for implementation, as mandated by federal or state regulation or standard.

Category II. Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.

No recommendation. Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exist.

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Definitions for the categories of the recommendations (IA-II, Unresolved issue) are provided at the end of the "Major Recommendations" field.

Recommendations regarding the frequency of replacing catheters, dressings, administration sets, and fluids also are provided (see Appendix B in the original guideline document).

Recommendations for Placement of Intravascular Catheters in Adults and Children

I. Health-care Worker Education and Training
   A. Educate health-care workers regarding the indications for intravascular catheter use, proper procedures for the insertion and maintenance of intravascular catheters, and appropriate infection-control measures to prevent intravascular catheter-related infections (Sherertz et al., 2000; Eggimann et al., 2000; Nehme, 1980; Soifer et al., 1998; Tomford & Hershey, 1985; Davis et al., 1999; Conly et al., 1989; East, 1994; Kyle & Myers, 1990; Bevier & Rice, 1994; Tomford et al., 1984). Category IA
   B. Assess knowledge of and adherence to guidelines periodically for all persons who insert and manage intravascular catheters (Sherertz et al., 2000; Eggimann et al., 2000; Soifer et al., 1998; Davis et al., 1999; Wenzel & Wentzel, 1991). Category IA
   C. Ensure appropriate nursing staff levels in intensive care units (ICUs) to minimize the incidence of catheter-related bloodstream infections (CRBSIs) (Fridkin et al., 1996; Robert et al., 2000; Vicca, 1999). Category IB

II. Surveillance
   A. Monitor the catheter sites visually or by palpation through the intact dressing on a regular basis, depending on the clinical situation of individual patients. If patients have tenderness at the insertion site, fever without obvious source, or other manifestations suggesting local or bloodstream infection (BSI), the dressing should be removed to allow thorough examination of the site (Pearson, 1996; White & Ragland, 1994; Lorenzen & Itkin, 1992; White, 1992). Category IB
   B. Encourage patients to report to their health-care provider any changes in their catheter site or any new discomfort. Category II
   C. Record the operator, date, and time of catheter insertion and removal, and dressing changes on a standardized form. Category II
   D. Do not routinely culture catheter tips (Pittet, Tarara, & Wenzel, 1994; Raad, Baba, & Bodey, 1995; Widmer et al., 1992). Category IA

III. Hand Hygiene
   A. Observe proper hand-hygiene procedures either by washing hands with conventional antiseptic-containing soap and water or with waterless alcohol-based gels or foams. Observe hand hygiene before and after palpating catheter insertion sites, as well as before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter. Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained (Eggimann et al., 2000; Larson et al., 1995; Boyce et al., 2002; Bischoff et al., 2000; Pittet et al., 1999; Simmons et al., 1990; Boyce, Kelliher, & Vallande, 2000). Category IA
   B. Use of gloves does not obviate the need for hand hygiene (Eggimann et al., 2000; Pittet et al., 1999; Simmons et al., 1990). Category IA

IV. Aseptic Technique During Catheter Insertion and Care
   A. Maintain aseptic technique for the insertion and care of intravascular catheters (Mermel et al., 1991; Raad et al., 1994; Capdevila, 1998; Abi-Said et al., 1999). Category IA
   B. Wear clean or sterile gloves when inserting an intravascular catheter as required by the Occupational Safety and Health Administration Bloodborne Pathogens Standard. Category IC. Wearing clean gloves rather than sterile gloves is acceptable for the insertion of peripheral intravascular catheters if the access site is not touched after the

application of skin antiseptics. Sterile gloves should be worn for the insertion of arterial and central catheters (Capdevila, 1998; CDC, 1988). Category IA

C. Wear clean or sterile gloves when changing the dressing on intravascular catheters. Category IC

V. Catheter Insertion

Do not routinely use arterial or venous cutdown procedures as a method to insert catheters (Povoski, 2000; Arrighi et al., 1989; Ahmed & Mohyuddin, 1998). Category IA

VI. Catheter Site Care

A. Cutaneous antisepsis

1. Disinfect clean skin with an appropriate antiseptic before catheter insertion and during dressing changes. Although a 2% chlorhexidine-based preparation is preferred, tincture of iodine, an iodophor, or 70% alcohol can be used (Maki, Ringer, & Alvarado, 1991; Garland et al., 1995; Little et al., 1999; Mimoz et al., 1996). Category IA
2. No recommendation can be made for the use of chlorhexidine in infants aged <2 months. Unresolved issue
3. Allow the antiseptic to remain on the insertion site and to air dry before catheter insertion. Allow povidone iodine to remain on the skin for at least 2 minutes, or longer if it is not yet dry before insertion (Maki, Ringer, & Alvarado, 1991; Garland et al., 1995; Little et al., 1999; Mimoz et al., 1996). Category IB
4. Do not apply organic solvents (e.g., acetone and ether) to the skin before insertion of catheters or during dressing changes (Maki & McCormack; 1987). Category IA

VII. Catheter-site Dressing Regimens

A. Use either sterile gauze or sterile, transparent, semipermeable dressing to cover the catheter site (Maki et al., 1994; Bijma et al., 1999; Rasero et al., 2000; Madeo et al., 1998). Category IA

B. Tunneled central venous catheter (CVC) sites that are well healed might not require dressings. Category II

C. If the patient is diaphoretic, or if the site is bleeding or oozing, a gauze dressing is preferable to a transparent, semi-permeable dressing (Maki et al., 1994; Bijma et al., 1999; Rasero et al., 2000; Madeo et al., 1998). Category II

D. Replace catheter-site dressing if the dressing becomes damp, loosened, or visibly soiled (Maki et al., 1994; Bijma et al., 1999). Category IB

E. Change dressings at least weekly for adult and adolescent patients depending on the circumstances of the individual patient (Rasero et al., 2000). Category II

F. Do not use topical antibiotic ointment or creams on insertion sites (except when using dialysis catheters) because of their potential to promote fungal infections and antimicrobial resistance (Zakrzewska-Bode et al., 1995; Flowers et al., 1989). Category IA (See Central Venous Catheters, Including Peripherally Inserted Central Venous Catheters [PICCs], Hemodialysis, and Pulmonary Artery Catheters, in Adult and Pediatric Patients, Section II.I).

G. Do not submerge the catheter under water. Showering should be permitted if precautions can be taken to reduce the likelihood of introducing organisms into the catheter (e.g., if the catheter and connecting device are protected with an impermeable cover during the shower) (Robbins, Cromwell, & Korones, 1999; Howell et al., 1995). Category II

VIII. Selection and Replacement of Intravascular Catheters

A. Select the catheter, insertion technique, and insertion site with the lowest risk for complications (infectious and noninfectious) for the anticipated type and duration of IV therapy (Mermel et al., 1991; Goetz et al., 1998; Trottier et al., 1995; Goetz et al., 1998; Martin et al., 1999; Robinson et al., 1995). Category IA

B. Promptly remove any intravascular catheter that is no longer essential (Lederle et al., 1992; Parenti et al., 1994). Category IA

C. Do not routinely replace central venous or arterial catheters solely for the purposes of reducing the incidence of infection (Cook et al., 1997; Cobb et al., 1992; Thomas et al., 1983). Category IB

D. Replace peripheral venous catheters at least every 72-96 hours in adults to prevent phlebitis (Lai, 1998). Leave peripheral venous catheters in place in children until IV therapy is completed, unless complications (e.g., phlebitis and infiltration) occur (Garland et al., 1992; Garland et al., 1987; Nelson & Garland, 1987; Shimandle et al., 1999). Category IB

E. When adherence to aseptic technique cannot be ensured (i.e., when catheters are inserted during a medical emergency), replace all catheters as soon as possible and after no longer than 48 hours (Mermel et al., 1991; Raad et al., 1994; Capdevila, 1998; Abi-Said et al., 1999). Category II

F. Use clinical judgment to determine when to replace a catheter that could be a source of infection (e.g., do not routinely replace catheters in patients whose only indication of infection is fever). Do not routinely replace venous catheters in patients who are bacteremic or fungemic if the source of infection is unlikely to be the catheter (O´Grady et al., 1998). Category II

G. Replace any short-term CVC if purulence is observed at the insertion site, which indicates infection (O´Grady et al., 1998; Mermel et al., 2001). Category IB

H. Replace all CVCs if the patient is hemodynamically unstable and CRBSI is suspected (O´Grady et al., 1998; Mermel et al., 2001). Category II

I. Do not use guidewire techniques to replace catheters in patients suspected of having catheter-related infection (Cook et al., 1997; Cobb et al., 1992). Category IB

IX. Replacement of Administration Sets*, Needleless Systems, and Parenteral Fluids

A. Administration sets

1. Replace administration sets, including secondary sets and add-on devices, no more frequently than at 72-hour intervals, unless catheter-related infection is suspected or documented (Sitges-Serra et al., 1985; Josephson et al., 1985; Maki et al., 1987; Snydman et al., 1987). Category IA

2. Replace tubing used to administer blood, blood products, or lipid emulsions (those combined with amino acids and glucose in a 3-in-1 admixture or infused separately) within 24 hours of

initiating the infusion (Melly et al., 1975; Mershon et al., 1986; Gilbert et al., 1986; Maki & Martin, 1975; Didier, Fischer, & Maki; 1998). Category IB. If the solution contains only dextrose and amino acids, the administration set does not need to be replaced more frequently than every 72 hours (Mershon et al., 1986). Category II

3. Replace tubing used to administer propofol infusions every 6 or 12 hours, depending on its use, per the manufacturer's recommendation (Bennett et al., 1995). Category IA

*(Note: Administration sets include the area from the spike of tubing entering the fluid container to the hub of the vascular access device. However, a short extension tube might be connected to the catheter and might be considered a portion of the catheter to facilitate aseptic technique when changing administration sets.)

B. Needleless intravascular devices
   1. Change the needleless components at least as frequently as the administration set (Arduino et al., 1997; Brown, Moss, & Elliott, 1997; Cookson et al., 1998; Luebke et al., 1998; McDonald, Banerjee, & Jarvis, 1998; Mendelson et al., 1998; Seymour et al., 2000). Category II
   2. Change caps no more frequently than every 72 hours or according to manufacturers' recommendations (Arduino et al., 1997; Cookson et al., 1998; McDonald, Banerjee, & Jarvis, 1998; Mendelson et al., 1998). Category II
   3. Ensure that all components of the system are compatible to minimize leaks and breaks in the system(Do et al., 1999). Category II
   4. Minimize contamination risk by wiping the access port with an appropriate antiseptic and accessing the port only with sterile devices (Cookson et al., 1998; Do et al., 1999; McDonald, Banerjee, & Jarvis, 1998). Category IB

C. Parenteral fluids
   1. Complete the infusion of lipid-containing solutions (e.g., 3-in-1 solutions) within 24 hours of hanging the solution (Crocker et al., 1984; Jarvis & Highsmith, 1984; Melly, Meng, & Schaffner, 1975; Mershon et al., 1986; Didier, Fischer, & Maki, 1998). Category IB
   2. Complete the infusion of lipid emulsions alone within 12 hours of hanging the emulsion. If volume considerations require more time, the infusion should be completed within 24 hours (Crocker et al., 1984; Jarvis & Highsmith, 1984; Melly, Meng, & Schaffner, 1975). Category IB
   3. Complete infusions of blood or other blood products within 4 hours of hanging the blood (Roth et al., 2000; Blajchman, 2000; Barrett, Andersen, & Anderson, 1993; Wagner, Friedman, & Dodd, 1994). Category II
   4. No recommendation can be made for the hang time of other parenteral fluids. Unresolved issue

X. IV-injection Ports

A. Clean injection ports with 70% alcohol or an iodophor before accessing the system (Luebke et al., 1998; Plott, Wagner Jr., & Tyring, 1990; Salzman, Isenberg, & Rubin, 1993). Category IA
B. Cap all stopcocks when not in use (Plott, Wagner Jr., & Tyring, 1990). Category IB

XI. Preparation and Quality Control of IV Admixtures

A. Admix all routine parenteral fluids in the pharmacy in a laminar-flow hood using aseptic technique (ASPH Council, 2000; Herruzo-Cabrera et al., 1984). Category IB
B. Do not use any container of parenteral fluid that has visible turbidity, leaks, cracks, or particulate matter or if the manufacturer's expiration date has passed (ASPH Council, 2000). Category IB
C. Use single-dose vials for parenteral additives or medications when possible (ASPH Council, 2000; Green et al., 1995). Category II
D. Do not combine the leftover content of single-use vials for later use. (ASPH Council on Professional Affairs, 2000; Green et al., 1995) Category IA
E. If multidose vials are used
    1. Refrigerate multidose vials after they are opened if recommended by the manufacturer. Category II
    2. Cleanse the access diaphragm of multidose vials with 70% alcohol before inserting a device into the vial (Salzman, Isenberg, & Rubin, 1993). Category IA
    3. Use a sterile device to access a multidose vial and avoid touch contamination of the device before penetrating the access diaphragm (Plott, Wagner Jr., & Tyring, 1990; Arrington et al., 1990). Category IA
    4. Discard multidose vial if sterility is compromised (Plott, Wagner Jr., & Tyring, 1990; Arrington et al., 1990). Category IA

XII. In-line Filters

Do not use filters routinely for infection-control purposes (Maddox et al., 1983; Falchuk, Peterson, & McNeil, 1985). Category IA

XIII. IV-therapy Personnel

Designate trained personnel for the insertion and maintenance of intravascular catheters (Soifer et al., 1998; Tomford & Hershey, 1985; Bijma et al., 1999; Cohran et al., 1996). Category IA

XIV. Prophylactic Antimicrobials

Do not administer intranasal or systemic antimicrobial prophylaxis routinely before insertion or during use of an intravascular catheter to prevent catheter colonization or bloodstream infection (BSI) (McKee et al., 1985; Ranson et al., 1990; Miller et al., 1996; Netto dos Santos, de Souza Fonseca, & Gontijo Filho, 1996). Category IA

Peripheral Venous Catheters, Including Midline Catheters, in Adult and Pediatric Patients

I. Selection of peripheral catheter

A. Select catheters on the basis of the intended purpose and duration of use, known complications (e.g., phlebitis and infiltration), and experience of individual catheter operators (Band & Maki, 1980; Tully et al., 1981; Ryder, 1995). Category IB
B. Avoid the use of steel needles for the administration of fluids and medication that might cause tissue necrosis if extravasation occurs (Band & Maki, 1980; Tully et al., 1981). Category IA
C. Use a midline catheter or peripherally inserted central catheter (PICC) when the duration of IV therapy will likely exceed 6 days (Ryder, 1995). Category IB

II. Selection of Peripheral-catheter Insertion Site

A. In adults, use an upper- instead of a lower-extremity site for catheter insertion. Replace a catheter inserted in a lower-extremity site to an upper-extremity site as soon as possible (Band & Maki, 1980; Maki, Goldman, & Rhame, 1973). Category IA
B. In pediatric patients, the hand, the dorsum of the foot, or the scalp can be used as the catheter insertion site. Category II
C. Replacement of catheter
    1. Evaluate the catheter insertion site daily, by palpation through the dressing to discern tenderness and by inspection if a transparent dressing is in use. Gauze and opaque dressings should not be removed if the patient has no clinical signs of infection. If the patient has local tenderness or other signs of possible catheter-related bloodstream infection (CRBSI), an opaque dressing should be removed and the site inspected visually. Category II
    2. Remove peripheral venous catheters if the patient develops signs of phlebitis (e.g., warmth, tenderness, erythema, and palpable venous cord), infection, or a malfunctioning catheter (Maki & Ringer, 1991). Category IB
    3. In adults, replace short, peripheral venous catheters at least 72-96 hours to reduce the risk for phlebitis. If sites for venous access are limited and no evidence of phlebitis or infection is present, peripheral venous catheters can be left in place for longer periods, although the patient and the insertion sites should be closely monitored (Maki & Ringer, 1991; Lai, 1998; Tager et al., 1983). Category IB
    4. Do not routinely replace midline catheters to reduce the risk for infection (Mermel, Parenteau, & Tow, 1995). Category IB
    5. In pediatric patients, leave peripheral venous catheters in place until IV therapy is completed, unless a complication (e.g., phlebitis and infiltration) occurs (Garland et al., 1992; Garland et al., 1987; Nelson & Garland, 1987; Shimandle et al., 1999). Category IB

III. Catheter and Catheter-site Care

Do not routinely apply prophylactic topical antimicrobial or antiseptic ointment or cream to the insertion site of peripheral venous catheters (Zakrzewska-Bode et al., 1995; Flowers et al., 1989). Category IA

Central Venous Catheters, Including Peripherally Inserted Central Catheters (PICCs), Hemodialysis, and Pulmonary Artery Catheters, in Adult and Pediatric Patients

I. Surveillance
   A. Conduct surveillance in intensive care units (ICUs) and other patient populations to determine catheter-related bloodstream infection (CRBSI) rates, monitor trends in those rates, and assist in identifying lapses in infection-control practices (CDC, 1998, 1999; Banerjee et al., 1991; Horan & Emori, 1997; Khuri-Bulos et al., 1999; Pittet & Wenzel, 1995; CDC, 1990-1999, 2000). Category IA
   B. Express ICU data as the number of catheter-associated bloodstream infections (BSIs) per 1,000 catheter-days for both adults and children and stratify by birth weight categories for neonatal ICUs to facilitate comparisons with national data in comparable patient populations and health-care settings (CDC, 1998, 1999; Banerjee et al., 1991; Horan & Emori, 1997; Khuri-Bulos et al., 1999; Pittet & Wenzel, 1995; CDC, 1990-1999, 2000). Category IB
   C. Investigate events leading to unexpected life-threatening or fatal outcomes. This includes any process variation for which a recurrence would likely present an adverse outcome (Joint Commission, 1994). Category IC

II. General Principles
   A. Use a central venous catheter (CVC) with the minimum number of ports or lumens essential for the management of the patient (Clark-Christoff et al., 1992; Early et al., 1990; Hilton et al., 1988; Yeung, May, & Hughes, 1988). Category IB
   B. Use an antimicrobial or antiseptic-impregnated CVC in adults whose catheter is expected to remain in place >5 days if, after implementing a comprehensive strategy to reduce rates of CRBSI, the CRBSI rate remains above the goal set by the individual institution based on benchmark rates (see Table 2 in the original guideline document) and local factors. The comprehensive strategy should include the following three components: educating persons who insert and maintain catheters, use of maximal sterile barrier precautions, and a 2% chlorhexidine preparation for skin antisepsis during CVC insertion (Raad et al., 1997; Veenstra et al., 1999; Maki et al., 1997; Veenstra, Saint, & Sullivan, 1999; Darouiche et al., 1999; Collin, 1999). Category IB
   C. No recommendation can be made for the use of impregnated catheters in children. Unresolved issue
   D. Designate personnel who have been trained and exhibit competency in the insertion of catheters to supervise trainees who perform catheter insertion (Sherertz et al., 2000; Eggimann et al., 2000; Soifer et al., 1998; Davis et al., 1999; Tomford et al., 1984; Wenzel & Wentzel, 1991). Category IA
   E. Use totally implantable access devices for patients who require long-term, intermittent vascular access. For patients requiring frequent or continuous access, a peripherally inserted central catheter (PICC) or tunneled CVC is preferable (Groeger et al., 1993; Pegues et al., 1992). Category II

F. Use a cuffed CVC for dialysis if the period of temporary access is anticipated to be prolonged (e.g., >3 weeks) (Foundation, 2001; Moss et al., 1990). Category IB

G. Use a fistula or graft instead of a CVC for permanent access for dialysis (Hoen et al., 1998). Category IB

H. Do not use hemodialysis catheters for blood drawing or applications other than hemodialysis except during dialysis or under emergency circumstances. Category II

I. Use povidone-iodine antiseptic ointment at the hemodialysis catheter exit site after catheter insertion and at the end of each dialysis session only if this ointment does not interact with the material of the hemodialysis catheter per manufacturer's recommendation (Levin et al., 1991; Maki & Band, 1981; Foundation, 2001). Category II

III. Selection of Catheter Insertion Site

A. Weigh the risk and benefits of placing a device at a recommended site to reduce infectious complications against the risk for mechanical complications (e.g., pneumothorax, subclavian artery puncture, subclavian vein laceration, subclavian vein stenosis, hemothorax, thrombosis, air embolism, and catheter misplacement) (Mermel et al., 1991; Goetz et al., 1998; Trottier et al., 1995; Robinson et al., 1995). Category IA

B. Use a subclavian site (rather than a jugular or a femoral site) in adult patients to minimize infection risk for nontunneled CVC placement (Mermel et al., 1991; Goetz et al., 1998; Trottier et al., 1995; Merrer et al., 2001). Category IA

C. No recommendation can be made for a preferred site of insertion to minimize infection risk for a nontunneled CVC (Venkataraman, Thompson, & Orr, 1997; Stenzel et al., 1989; Goldstein, Weber, & Sheridan, 1997). Unresolved issue

D. Place catheters used for hemodialysis and pheresis in a jugular or femoral vein rather than a subclavian vein to avoid venous stenosis if catheter access is needed (Schillinger et al., 1991; Cimochowski et al., 1990; Barrett et al., 1988; Trerotola et al., 2000; Macdonald et al., 2000). Category IA

IV. Maximal Sterile Barrier Precautions During Catheter Insertion

A. Use aseptic technique including the use of a cap, mask, sterile gown, sterile gloves, and a large sterile sheet, for the insertion of CVCs (including PICCs) or guidewire exchange (Mermel et al., 1991; Raad et al., 1994). Category IA

B. Use a sterile sleeve to protect pulmonary artery catheters during insertion (Cohen et al., 1998). Category IB

V. Replacement of Catheter

A. Do not routinely replace CVCs, PICCs, hemodialysis catheters, or pulmonary artery catheters to prevent catheter-related infections (Eyer et al., 1990; Cook et al., 1997; Cobb et al., 1992). Category IB

B. Do not remove CVCs or PICCs on the basis of fever alone. Use clinical judgment regarding the appropriateness of removing the catheter if infection is evidenced elsewhere or if a noninfectious cause of fever is suspected (O´Grady et al., 1998; Widmer, 1997). Category I

C. Guidewire exchange

1. Do not use guidewire exchanges routinely for nontunneled catheters to prevent infection (Cobb et al., 1992; Powell et al., 1988). Category IB

2. Use a guidewire exchange to replace a malfunctioning nontunneled catheter if no evidence of infection is present (Cobb et al., 1992; Powell et al., 1988). Category IB
3. Use a new set of sterile gloves before handling the new catheter when guidewire exchanges are performed (Mermel et al., 1991; Raad et al., 1994). Category II

VI. Catheter and Catheter-site Care

A. General measures

Designate one port exclusively for hyperalimentation if a multilumen catheter is used to administer parenteral nutrition (Snydman et al., 1982). Category II

B. Antibiotic lock solutions

Do not routinely use antibiotic lock solutions to prevent CRBSI. Use prophylactic antibiotic lock solution only in special circumstances (e.g., in treating a patient with a long-term cuffed or tunneled catheter or port who has a history of multiple CRBSIs despite optimal maximal adherence to aseptic technique)(Henrickson et al., 2000; Carratala et al., 1999; Easom, 2000; Vercaigne et al., 2000). Category II

C. Catheter-site dressing regimens
1. Replace the catheter-site dressing when it becomes damp, loosened, or soiled or when inspection of the site is necessary (Maki & Ringer, 1987; Maki et al., 1994; Rasero et al., 2000). Category IA
2. Replace dressings used on short-term CVC sites every 2 days for gauze dressings and at least every 7 days for transparent dressings, except in those pediatric patients in which the risk for dislodging the catheter outweighs the benefit of changing the dressing (Rasero et al., 2000). Category IB
3. Replace dressings used on tunneled or implanted CVC sites no more than once per week, until the insertion site has healed (Rasero et al., 2000). Category IB
4. No recommendation can be made regarding the necessity for any dressing on well-healed exit sites of long-term cuffed and tunneled CVCs. Unresolved issue

D. No recommendation can be made for the use of chlorhexidine sponge dressings to reduce the incidence of infection. Unresolved issue

E. Do not use chlorhexidine sponge dressings in neonates aged <7 days or of gestational age <26 weeks (Garland et al., 2001). Category II

F. No recommendation can be made for the use of sutureless securement devices. Unresolved issue

G. Ensure that catheter-site care is compatible with the catheter material (Rao & Oreopoulos, 1997; Riu et al., 1998). Category IB

H. Use a sterile sleeve for all pulmonary artery catheters (Cohen et al., 1998). Category IB

Additional Recommendations for Peripheral Arterial Catheters and Pressure Monitoring Devices for Adult and Pediatric Patients

I. Selection of Pressure Monitoring System

Use disposable, rather than reusable, transducer assemblies when possible (Donowitz et al., 1979; Luskin et al., 1986; Maki & Hassemer, 1981; Mermel & Maki, 1989; Tenold et al., 1987). Category IB

II. Replacement of Catheter and Pressure Monitoring System
   A. Do not routinely replace peripheral arterial catheters to prevent catheter-related infections (Eyer et al., 1990; Raad et al., 1993; Thomas et al., 1983; Leroy et al., 1989). Category II
   B. Replace disposable or reusable transducers at 96-hour intervals. Replace other components of the system (including the tubing, continuous-flush device, and flush solution) at the time the transducer is replaced (Mermel et al., 1991; Luskin et al., 1986). Category IB

III. Care of Pressure Monitoring Systems
   A. General measures
      1. Keep all components of the pressure monitoring system (including calibration devices and flush solution) sterile (Donowitz et al., 1979; Fisher et al., 1981; Stamm et al., 1975; Weinstein et al., 1976). Category IA
      2. Minimize the number of manipulations of and entries into the pressure monitoring system. Use a closed-flush system (i.e., continuous flush), rather than an open system (i.e., one that requires a syringe and stopcock), to maintain the patency of the pressure monitoring catheters (Mermel & Maki, 1989; Shinozaki et al., 1983). Category II
      3. When the pressure monitoring system is accessed through a diaphragm rather than a stopcock, wipe the diaphragm with an appropriate antiseptic before accessing the system (Mermel & Maki, 1989). Category IA
      4. Do not administer dextrose-containing solutions or parenteral nutrition fluids through the pressure monitoring circuit (Mermel & Maki, 1989; Solomon et al., 1986; Weems Jr. et al., 1987). Category IA
   B. Sterilization or disinfection of pressure monitoring systems
      1. Use disposable transducers (Mermel & Maki, 1989; Solomon et al., 1986; Weems Jr. et al., 1987; Beck-Sague et al., 1990; Villarino et al., 1989). Category IB
      2. Sterilize reusable transducers according to the manufacturer's instructions if the use of disposable transducers is not feasible (Mermel & Maki, 1989; Solomon et al., 1986; Weems Jr. et al., 1987; Beck-Sague et al., 1990; Villarino et al., 1989). Category IA

Recommendations for Umbilical Catheters

I. Replacement of Catheters
   A. Remove and do not replace umbilical artery catheters if any signs of CRBSI, vascular insufficiency, or thrombosis are present (Boo et al., 1999). Category II
   B. Remove and do not replace umbilical venous catheters if any signs of CRBSI or thrombosis are present (Boo et al., 1999). Category II

C. No recommendation can be made for treating through an umbilical venous catheter suspected of being infected. Unresolved issue
D. Replace umbilical venous catheters only if the catheter malfunctions. Category II

II. Catheter-site Care

A. Cleanse the umbilical insertion site with an antiseptic before catheter insertion. Avoid tincture of iodine because of the potential effect on the neonatal thyroid. Other iodine-containing products (e.g., povidone-iodine) can be used (Garland et al., 1995; Krauss, Albert, & Kannan, 1970; Landers et al., 1991; Cronin, Germanson, & Donowitz, 1990; Miller et al., 1989). Category IB
B. Do not use topical antibiotic ointment or creams on umbilical catheter insertion sites because of the potential to promote fungal infections and antimicrobial resistance (Zakrzewska-Bode et al., 1995; Flowers et al., 1989). Category IA
C. Add low doses of heparin (0.25-1.0 F/ml) to the fluid infused through umbilical arterial catheters (Ankola & Atakent, 1993; Horgan et al., 1987; David et al., 1981). Category IB
D. Remove umbilical catheters as soon as possible when no longer needed or when any sign of vascular insufficiency to the lower extremities is observed. Optimally, umbilical artery catheters should not be left in place >5 days (Boo et al., 1999; Fletcher et al., 1994). Category II
E. Umbilical venous catheters should be removed as soon as possible when no longer needed but can be used up to 14 days if managed aseptically (Seguin et al., 1994; Loisel et al., 1996). Category II

Definitions:

The Centers for Disease Control and Prevention (CDC) and the Healthcare Infection Control Practices Advisory Committee (HICPAC) system for categorizing recommendations is as follows:

Category IA. Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies

Category IB. Strongly recommended for implementation and supported by some experimental, clinical, or epidemiologic studies, and a strong theoretical rationale.

Category IC. Required by state or federal regulations, rules, or standards.

Category II. Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.

Unresolved issue. Represents an unresolved issue for which evidence is insufficient or no consensus regarding efficacy exists.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see Major Recommendations").

As in previous guidelines issued by the Centers for Disease Control and Prevention (CDC) and the Healthcare Infection Control Practices Advisory Committee (HICPAC), each recommendation is categorized on the basis of existing scientific data, theoretical rationale, applicability, and economic impact.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Improved patient outcome and decreased health-care costs by reducing the infectious complications associated with intravascular catheter use

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- Recommendations should be considered in the context of the institution's experience with catheter-related infections, experience with other adverse catheter-related complications (e.g., thrombosis, hemorrhage, and pneumothorax), and availability of personnel skilled in the placement of intravascular devices.
- The impact these recommendations will have on individual institutions should be evaluated using specific performance indicators listed in the guideline document.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness
Safety

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

O'Grady NP, Alexander M, Dellinger EP, Gerberding JL, Heard SO, Maki DG, Masur H, McCormick RD, Mermel LA, Pearson ML, Raad II, Randolph A, Weinstein RA. Guidelines for the prevention of intravascular catheter-related infections [published erratum appears in MMWR Weekly 2002 Aug 16;51(32):71]. MMWR Recomm Rep 2002 Aug 9;51(RR-10):1-29. [293 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1996 (revised 2002 Aug 9)

GUIDELINE DEVELOPER(S)

American Academy of Pediatrics - Medical Specialty Society
American College of Chest Physicians - Medical Specialty Society
American Society of Critical Care Anesthesiologists - Professional Association
American Thoracic Society - Medical Specialty Society
Association for Professionals in Infection Control and Epidemiology, Inc. - Professional Association
Centers for Disease Control and Prevention - Federal Government Agency [U.S.]
Infectious Diseases Society of America - Medical Specialty Society
Infusion Nurses Society - Professional Association
Oncology Nursing Society - Professional Association
Society for Healthcare Epidemiology of America - Professional Association
Society of Critical Care Medicine - Professional Association
Society of Interventional Radiology - Medical Specialty Society
Surgical Infection Society - Professional Association

GUIDELINE DEVELOPER COMMENT

This report was prepared by a working group comprising members from professional organizations representing the disciplines of critical care medicine, infectious diseases, health-care infection control, surgery, anesthesiology, interventional radiology, pulmonary medicine, pediatric medicine, and nursing. The working group was led by the Society of Critical Care Medicine (SCCM), in collaboration with the Infectious Diseases Society of America (IDSA), Society for Healthcare Epidemiology of America (SHEA), Surgical Infection Society (SIS), American College of Chest Physicians (ACCP), American Thoracic Society (ATS), American Society of Critical Care Anesthesiologists (ASCCA), Association for Professionals in Infection Control and Epidemiology (APIC), Infusion Nurses Society (INS), Oncology Nursing Society (ONS), Society of Interventional Radiology (formerly the Society of Cardiovascular and Interventional Radiology (SCVIR), American Academy of Pediatrics (AAP), and the Healthcare Infection Control Practices Advisory Committee (HICPAC) of the Centers for Disease Control and Prevention (CDC).

SOURCE(S) OF FUNDING

United States Government

GUIDELINE COMMITTEE

Healthcare Infection Control Practices Advisory Committee

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previously released version: Am J Infect Control 1996 Aug;24(4):262-93.

GUIDELINE AVAILABILITY

Electronic copies: Available from the Centers for Disease Control and Prevention (CDC) Web site:

- HTML Format
- Portable Document Format (PDF)

Print copies: Available from the Centers for Disease Control and Prevention, MMWR, Atlanta, GA 30333. Additional copies can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325; (202) 783-3238.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on March 17, 2003.

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